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UNITED STATES PATENT AND TRADEMARK OFFICE

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BEFORE THE BOARD OF PATENT APPEALS  
AND INTERFERENCES

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*Ex parte* ARIE VAN ZON, ROBERT MOENE,  
PHILLIP EDWARD UNGER, PETER ARNOLDY,  
and ERIC JOHANNES MARIA DE BOER

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Appeal 2008-0162  
Application 10/668,934  
Technology Center 1700

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Decided: March 25, 2008

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Before BRADLEY R. GARRIS, CHARLES F. WARREN, and  
PETER F. KRATZ, *Administrative Patent Judges*.

WARREN, *Administrative Patent Judge*.

DECISION ON APPEAL

Applicants appeal to the Board from the decision of the Primary Examiner finally rejecting claims 1 through 7 in the Office Action mailed June 13, 2005. 35 U.S.C. §§ 6 and 134(a)(2002); 37 C.F.R. § 41.31(a) (2006).

We affirm the decision of the Primary Examiner.

Claim 1 illustrates Appellants' invention of a process for making a linear alpha-olefin oligomer, and is representative of the claims on appeal:

1. A process for making a linear alpha-olefin oligomer in a reactor comprising a liquid and a gas phase, comprising the steps of catalytically oligomerizing ethylene in the presence of a complex selected from the group consisting of nickel, palladium, cobalt, titanium, zirconium, hafnium, vanadium, chromium, molybdenum, and tungsten complexes, to an alpha-olefin oligomer under release of heat, and removing the heat with a heat exchanger which is positioned in the gas phase in the reactor but not in direct contact with the liquid phase, using at least part of the gas phase as a coolant medium.

The Examiner relies upon the evidence in these references (Ans. 3):

|        |                 |               |
|--------|-----------------|---------------|
| Hinton | US 3,461,109    | Aug. 12, 1969 |
| Reagan | EP 0 608 447 A1 | Aug. 3, 1994  |
| Gibson | WO 00/15646 A1  | Mar. 23, 2000 |

Appellants request review of the following grounds of rejection advanced on appeal (Br. 2-3):

Claims 1 and 3 through 7 under 35 U.S.C. § 103(a) as unpatentable over Gibson in view of Hinton (Ans. 3); and

Claim 2 under 35 U.S.C. § 103(a) as unpatentable over Gibson in view of Hinton further in view of Reagan (Ans. 4).

Appellants argue the claims in the first ground of rejection as a group. Br. 3-4. Appellants further “request that the rejection of claim 2 be overturned for the reasons discussed . . . in connection with [Gibson] and [Hinton].” Br. 5. Thus, we decide this appeal based on independent claim 1. 37 C.F.R. § 41.37(c)(1)(vii)(2006).

The issues in this appeal are whether the Examiner has carried the burden of establishing a prima facie case in each of the grounds of rejection advanced on appeal.

The plain language of claim 1, with reference to Specification Fig. 2, specifies a process for making a linear alpha-olefin oligomer in reactor 2 comprising at least liquid phase section 3 and gas phase section 4. The

process comprises at least the steps of catalytically oligomerizing ethylene in the presence of a stated complex catalyst under release of heat and removing the heat with heat exchanger 20 positioned in gas phase section 4 of the reactor but not in contact with the liquid phase section, wherein at least part of the gas in the gas phase section is used as a coolant medium. *See* Spec. 9:14-28. With respect to gas as a coolant medium, Appellants explain “[t]he reaction heat causes the solvents, reactants, and/or reaction products . . . present in the reaction medium, to evaporate and subsequently to be cooled by the heat exchanger, after which it works as a coolant medium for the reactor” by falling into the liquid phase. Spec 6:3-7 and 9:22-26. We find no basis in the claim language or in the disclosure in the Specification on which to read such disclosure as a limitation into claim 1. *See, e.g., In re Zletz*, 893 F.2d 319, 321-22 (Fed. Cir. 1989).

We find Gibson would have disclosed to one of ordinary skill in this art a “catalyst for polymerizing and oligomerizing monomers, for example, olefins such as  $\alpha$ -olefins,” including ethylene. Gibson 2:15-19. There is no dispute that Gibson’s cobalt complex catalyst falls within appealed claim 1. Gibson discloses methods of conducting gas phase polymerization processes including the steps of “feeding . . . [to the fluidized catalyst bed] a stream of monomer at least partially in the gaseous phase . . . such that at least part of the monomer polymerizes in contact with the catalyst in the bed.” Gibson 12:10-16. “The bed is generally cooled by the addition of cool gas (e.g., recycled gaseous monomer) and/or volatile liquid (e.g. a volatile inert hydrocarbon, or gaseous monomer which has been condensed to form a liquid).” Gibson 12:16-20 and 14:5-18. The fluidizing gas for the fluidized catalyst bed supplies monomer and some inert gas, such as nitrogen or an

alkane, and serves to remove the heat of polymerization from the bed, with the hot reactor gas “then led to a heat exchanger to remove at least part of the heat of polymerization” by cooling the reactor gas. Gibson 13:10-23 and 14:1-6. The cooled reactor gas including condensed volatile liquid is recycled to the bed, with the latter evaporating in the bed and removing heat therefrom. Gibson 14:5-18. Gibson discloses the amount of liquid in the gas phase zone is small compared to the amount of polymer present, in contrast to solution and slurry phase processes. Gibson 12:20-25.

We find Hinton would have disclosed to one of ordinary skill in this art a process wherein any monomer or monomers

can be solution polymerized to polymer concentrations . . . by utilizing a reactor which contains a heat transfer surface in the upper portion thereof and by maintaining a substantially liquid mixture of monomer, solvent and catalyst in the lower portion of the reactor below the heat transfer surface and under polymerization conditions which produce vapors of the solvent or monomer or both. . . . [T]he temperature in the reactor after warm-up is maintained at a desired value by removal of the polymerization heat of reaction through the condensation of the vapors on the heat transfer surface. The condensed vapors are allowed to continuously and freely return directly to the mixture in the lower portion of the reactor.

Hinton col. 1, ll. 38-60. Hinton teaches the reactor can be employed in continuous-flow polymerization. Hinton col. 3, ll. 67-72. Hinton discloses that, alternatively, the process “can be practiced with the use of a heat exchanger external to the reactor with direct and immediate recycle of condensate to the reactor.” Hinton col. 4, ll. 1-6. “Generally, one or more polyolefin monomers can be utilized as feed material for this invention. However, preferred monomers are dienes, still more preferably conjugated dienes.” Hinton col. 4, ll. 7-9. Hinton illustrates reactor 2 in which heat

transfer coil 6 is positioned in the gas phase section which is separated from the liquid phase section by entrainment separator 19. Hinton col. 2, l. 47 to col. 3, l. 30, and Fig.

We determine the combined teachings of Gibson and Hinton, the scope of which we determined above, provide convincing evidence supporting the Examiner's case that the claimed invention encompassed by claim 1, as we interpreted this claim above, would have been *prima facie* obviousness to one of ordinary skill in the molding arts familiar with the catalytic polymerization and oligomerization of alpha-olefins, including ethylene, and the requirements for reactors used to conduct the reactions. On this record, we agree with the Examiner's determination that, *prima facie*, one of ordinary skill in this art would have used Hinton's reactor to conduct the oligomerization reaction of ethylene with the cobalt complex catalyst taught by Gibson in the reasonable expectation of obtaining the oligomerized ethylene product. Ans. 3-4. Indeed, this person would have recognized that Hinton specifies no limitation on the monomers that can be solution polymerized in the reactor, and that Gibson's processes can include feeding partially liquid monomers as well as volatile liquids to the catalyst bed for cooling purposes, wherein evaporated monomer gases and volatilized liquids are collected in the reactor and then condensed in a heat exchanger and recycled to the bed. While Gibson appears to disclose leading these gases to an external heat exchanger, we determine, as does the Examiner (Ans. 3), that this person would have further recognized that in Gibson's process, such gases can be condensed in a gas zone of the reactor for return of liquids therein as a cooling medium to the catalyst bed in the reaction zone, avoiding the need for an external heat exchanger and recycle

lines. Thus, this person would have further recognized that Hinton's reactor with the heat exchanger located in a gas zone above the catalyst bed reaction zone has the gas zone wherein the zones are separated by an entrainment separator, can reasonably be used for Gibson's purposes. Indeed, Hinton discloses the internal heat exchanger is an alternative to an external heat exchanger.

Accordingly, we are of the opinion the Examine correctly recognized that, *prima facie*, one of ordinary skill in this art routinely following the combined teachings of Gibson and Hinton would have reasonably arrived at the claimed process encompassed by claim 1, including all of the limitations thereof, without resort to Appellants' Specification. *See, e.g., KSR Int'l Co. v. Teleflex Inc.*, 127 S. Ct. 1727, 1740-41 (2007) *quoting In re Kahn*, 441 F.3d 977, 988 (Fed. Cir. 2006)("[A]nalysis [of whether the subject matter of a claim would have been obvious] need not seek out precise teachings directed to the specific subject matter of the challenged claim, for a court can take account of the inferences and creative steps that a person of ordinary skill in the art would employ."); *In re Siebentritt*, 372 F.2d 566, 567-68 (CCPA 1967)(express suggestion to interchange methods which achieve the same or similar results is not necessary to establish obviousness); *see also In re O'Farrell*, 853 F.2d 894, 903-04, 7 USPQ2d 1673, 1681 (Fed. Cir. 1988)("For obviousness under § 103, all that is required is a reasonable expectation of success." (citations omitted)); *In re Keller*, 642 F.2d 413, 425 (CCPA 1981) ("[T]he test is what the combined teachings of the references would have suggested to those of ordinary skill in the art."); *In re Sovish*, 769 F.2d 738, 743 (Fed. Cir. 1985) (skill is presumed on the part of one of ordinary skill in the art); *In re Bozek*,

416 F.2d 1385, 1390 (CCPA 1969) (“Having established that this knowledge was in the art, the examiner could then properly rely, as put forth by the solicitor, on a conclusion of obviousness ‘from common knowledge and common sense of the person of ordinary skill in the art without any specific hint or suggestion in a particular reference.’”).

Upon reconsideration of the record as a whole in light of Appellants’ contentions, we are of the opinion that Appellants have not successfully rebutted the prima facie case. We agree with Appellants’ findings with respect to the teachings of Gibson (Br. 3:16-27) and we made similar findings above. However, we disagree with Appellants that Gibson does not disclose “a discrete liquid phase where most of the reaction takes place and also a discrete gas phase from which unreacted reaction components and some reaction products may be condensed” (Br. 3:27-4:12), and with the further implication in this contention that Gibson’s processes are not encompassed by claim 1. We are of the view that Gibson’s disclosure of a partially liquid monomer feed and volatile liquid feed to the catalyst bed and collection of volatilized liquids leading to a heat exchanger, meets the claim limitations of a process comprising at least “a liquid phase” and the evaporation of these liquids in the catalyst bed gives rise to “a gas phase” in the reactor. In this respect, we determine there is no basis in the claim language or in the disclosure in the Specification to read a liquid phase catalyst reaction as a limitation into claim 1 which excludes a gas phase reaction from liquid monomer vaporized in the catalyst bed. *See, e.g., Zletz*, 893 F.2d at 321-22. Indeed, the plain language of claim 1 does not specify that the process must be conducted in “a liquid phase” or in “a gas phase.”



Furthermore, contrary to Appellants' contentions (Br. 4-5), Hinton's disclosure of the polymerization of dienes as a preferred use of the reactor taught therein does not limit the teachings of the reference. *See, e.g., In re Lamberti*, 545 F.2d 747, 750 (CCPA 1976) ("[T]he fact that a specific [embodiment] is taught to be preferred is not controlling, since all disclosures of the prior art, including unpreferred embodiments, must be considered."). Similarly, one of ordinary skill in this art would have recognized that like Gibson, Hinton's reactor condenses and recycles evaporated materials back to the catalytic polymerization medium, and thus, would have combined the similar references to take advantage of Hinton's reactor which condenses the materials in a gas phase zone of the reactor. *See, e.g., Kahn*, 441 F.3d at 985-88.

Accordingly, based on our consideration of the totality of the record before us, we have weighed the evidence of obviousness found in the combined teachings of Gibson and Hinton with Appellants' countervailing evidence of and argument for nonobviousness and conclude that the claimed invention encompassed by appealed claims 1 and 3 through 7 would have been obvious as a matter of law under 35 U.S.C. § 103(a).

On this basis we also affirm the ground of rejection of claim 2 under 35 U.S.C. § 103(a). *See* Br. 5; *see above* p. 2.

The Primary Examiner's decision is affirmed.

No time period for taking any subsequent action in connection with this appeal may be extended under 37 C.F.R. § 1.136(a)(1)(iv) (2007).

AFFIRMED

Appeal 2008-0162  
Application 10/668,934

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